

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
24 October 2002 (24.10.2002)

PCT

(10) International Publication Number
WO 02/083399 A1

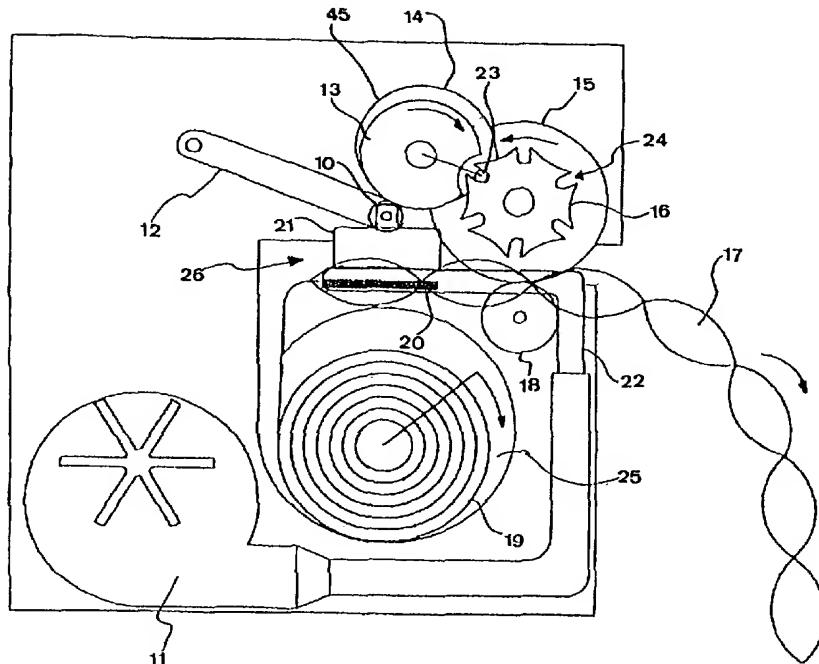
- (51) International Patent Classification⁷: **B29C 65/18, B65D 81/03**
- (21) International Application Number: **PCT/IL02/00300**
- (22) International Filing Date: 13 April 2002 (13.04.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
142656 17 April 2001 (17.04.2001) IL
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- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: DEVICE FOR INFLATING PACKAGING MATERIAL



WO 02/083399 A1

(57) Abstract: The invention discloses a device for producing inflated cellular packaging material from non-inflated packaging material on an as-needed basis.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

DEVICE FOR INFLATING PACKAGING MATERIAL

FIELD OF THE INVENTION

The invention relates to the field of cushioned packaging material. More specifically, the present invention relates to a device for inflating packaging material on an as-needed, real-time basis.

BACKGROUND OF THE INVENTION

Packaging material comprised of air-filled cushions is well known in the art and provides a reliable and safe way to protect merchandise during shipping and transportation. Due to the bulkiness of the air cushions, however, cushioned packaging material can be extremely inconvenient both for manufacturers and users.

A number of devices are available in the art that enable an end-user to obtain packaging material adapted to be inflated on an as-needed basis. Israeli patent application No. 12304198, incorporated herein by reference, describes a device for forming plastic pouches from two substantially superimposed layers of plastic sheet. The device includes a pair of rollers for selectively advancing the layers of plastic sheet, an air-filling element, and heat welding means for sealing open sides of the pouches.

Other devices for forming air-filled material can be found in the following patents, all of which are herein incorporated by reference: US 6029428 to Terminella et al., US 5746043 to Terminella et al., US 5058361 to Schmacher, US 5143775 to Olsson et al., US 5021039 to Richter et al., US 5009318 to Lepinoy et al., and US 4604854 to Andreas et al.

None of the aforementioned patents or patent applications meet the

requirements for an user-end device for inflating packaging material. To be practical for use on a real-time basis, the device should be as simple to use, and convenient as possible. A user requiring the cushioned packaging material should be able to easily and quickly inflate the needed amount of cushioned packaging material as it is needed for packaging of merchandise.

SUMMARY OF THE INVENTION

The present invention meets the aforementioned requirements by providing a device for producing inflated cellular packaging material from non-inflated packaging material on an as-needed basis, comprising advancing means for advancing non-inflated packaging material from a dispensing roll, inflating means for inflating sections of said non-inflated packaging material in a successive manner, sealing means for sealing said inflated sections of the packaging material as said sections are inflated, and a geneva mechanism comprising;

- (a) a geneva wheel having a plurality of slots;
- (b) a lock wheel coupled to a motor, said lock wheel having a drive pin engageable by said slots for driving the geneva wheel in an intermittent manner;

wherein the geneva mechanism is coupled to the advancing means and to sealing means such that said packaging material is advanced through the device in an intermittent manner, alternating between a resting phase and a moving phase, wherein during the resting phase, the sealing means operate to seal an inflated section of the packaging material, and during the moving phase, the sealed inflated section is conveyed towards the exterior of the device (to the user).

The device may be adapted for packaging material that has been pre-welded

by the manufacturer in a predetermined manner. Alternatively, the device may be adapted for packaging material that has not been pre-welded. In this embodiment, the device includes means for welding the packaging material in a predetermined manner.

According to preferred embodiments of the present invention, the advancing means comprises an upper advance wheel and a lower advance wheel, said upper advance wheel being coupled to said geneva wheel such that when the drive pin is engaged in a slot of the geneva wheel, the packaging material is advanced by a predetermined amount.

Further according to preferred embodiments of the present invention, the inflating means comprises an air blower and an inflating pipe. As an example, the air blower may be a DC centrifugal air blower.

Still further according to preferred embodiments of the present invention, the device further comprises a cam wheel coupled to the lock wheel. The cam wheel has a radially-symmetric portion that is adapted to effect movement of the sealing means in an intermittent manner (via coupling through a cam follower), thereby facilitating intermittent sealing of successive air-filled pockets of the packaging material.

Moreover according to preferred embodiments of the present invention, the sealing means comprises a heat seal element, seal pads, and a sealing arm, wherein the sealing arm has a cam follower at one end thereof. When the cam wheel rotates such that the radially-symmetric portion of said cam wheel contacts the cam follower, the sealing arm moves downward, causing the heat seal element to move in a corresponding downward manner towards the seal pads so as to seal a section of inflated packaging material.

Further according to preferred embodiments of the present invention, the radially-symmetric portion of the cam wheel contacts the cam follower when the

geneva wheel is in a resting phase.

The heat seal element may be, for example, a PTC heating element.

The present invention further relates to a compact device for producing inflated cellular packaging material from non-inflated packaging material on an as-needed basis, comprising;

- (a) a geneva mechanism containing a lock wheel coupled to motor, and a geneva wheel, said lock wheel containing a drive pin for driving movement of said geneva wheel in an intermittent manner;
- (b) a cam wheel and a lock wheel, said cam wheel being coupled to said lock wheel, and said cam wheel having a radially-symmetric portion;
- (c) advancing means for advancing pre-welded non-inflated packaging material from a dispensing roll, wherein said advancing means are coupled to said geneva wheel such that advancement of the packaging material occurs in an intermittent manner;
- (d) inflating means comprising an air blower and an inflating pipe;
- (e) sealing means comprising a heat seal element, seal pads, and a sealing arm, wherein said cam follower is positioned at one end of said sealing arm such that when said radially-symmetric portion of the cam wheel contacts the cam follower, said sealing arm moves downward, causing said heat seal element to move in a corresponding downward manner towards said seal pads so as to seal a section of inflated packaging material.

In some preferred embodiments the device is adapted for non-inflated packaging material that is pre-welded. In other preferred embodiments, the device is adapted for non-inflated packaging material that is not pre-welded. In embodiments where the packaging material is pre-welded, the device requires fewer parts and is

thus more compact. In embodiments where the packaging material is not pre-welded, the device has welding means for welding the packaging material in a predetermined manner prior to inflation with air. The detailed description will be provided in reference to the device adapted for pre-welded packaging material. It should be appreciated that various embodiments of both types are possible and that the description provided is for the purposes of example and clarification only.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 illustrates a side view of a device for inflating packaging material, according to a preferred embodiment of the present invention.

Figures 2, 3, and 4 represent the sequence of steps occurring during the inflating of packaging material using the device of Figure 1.

DETAILED DESCRIPTION OF THE DRAWINGS

The detailed description provided is intended to describe certain preferred embodiments of the present invention. It is in no way intended to limit the scope of the invention, as set out in the claims.

In reference to Figure 1, the device contains a holding section (25) adapted for containing a roll of pre-welded non-inflated packaging material (19). The material is dispensed from the roll and inflated on an as-needed basis. In the embodiment illustrated, the device is compact, usually about the size of an office printer. The packaging material is specially adapted for being inflated and sealed by the device. In some embodiments, the packaging material is comprised of successive rows of

welded plastic rectangular-shaped pockets, each row having two side-by-side pockets. In the center, a channel exists for enabling the inflation of the pockets with air using the device. For each pocket, there is a hole in the welding that is in communication with the channel that allows for passage therethrough of air. The rows are inflated one at a time. Following inflation of each row, the hole on either side of the channel is sealed. Then the material is advanced by the device so that the next row is filled and sealed. The packaging material can be manufactured with perforations, both along the channel and in between the rows, so that the user can separate off the desired amount of packaging material once said packaging material is inflated. A complete description of this and other packaging materials can be found in Israeli patent application No. 138132, hereby incorporated by reference.

Advancing means enable advancing the packaging material (19) from the roll and to the inflating area (26) of the device. The advancing means comprises an upper advance wheel (15) and a lower advance wheel (18). Inflated packaging material (17) is advanced towards the exterior of the device by the rotation of the two advancing wheels (15) (18). At the same time, non-inflated packaging material is advanced towards the inflating area.

The device further comprises inflating means for inflating successive sections of the non-inflated packaging material. The inflating means comprises an air blower (11) and an air inlet pipe (22). The end of the air inlet pipe (22) has a plurality of holes (not shown) that release air into the inflating area (26). In use, the air inlet pipe (22) is situated in the channel of the packaging material (the channel may be in the middle or on the side of the packaging material). When the packaging material is advanced by the advancing means, a knife (not shown) positioned on the lower side of the inlet pipe (preferably, the knife is situated a few centimeters from the end of the

pipe) cuts the bottom layer of the channel so as to enable advancement of the packaging material over the air inlet pipe while enabling inflation of the air pockets. In embodiments where the packaging material has a perforation along the channel, the knife does not need to be sharp; it needs only to be pointed enough so as to penetrate through the perforations. In embodiments without the perforations, the knife needs to be sharp enough to cut through the lower plastic layer of the channel. The air blower is preferably always in operation when the device is on.

The device further comprises sealing means for sealing a section of the packaging material immediately after said section is inflated. The sealing means comprises a heat seal element (21) and a pair of seal pads (20) (in the embodiment using packaging material having a central channel, each of the seal pads operate to seal the hole located on either side of the channel that communicates with the pockets). A sealing arm (12) is associated with the heat seal element for causing lowering of the heat seal element (21) towards the seal pads (20) on an intermittent basis. When the heat seal element (21) is lowered, inflated air pockets of the packaging material become sealed as a result of the heat seal element (21) (on top of the channel of the packaging material) pressing against the seal pads (20) (below the channel of the packaging material).

The device further comprises a geneva mechanism that is coupled both to the advancing means and to the sealing means and that enables a section of packaging material to be moved to the inflating area (26) of the device, inflated and sealed, and then advanced to the exterior of the device such that a subsequent section undergoes a similar process, until the desired length of inflated packaging material is achieved. The geneva mechanism comprises a geneva wheel (16) having a plurality of slots (24), as an example, 6. The geneva wheel is coupled to the upper advance wheel (16)

of the advancing means, preferably by situation on the same shaft. The geneva mechanism also comprises a lock wheel (13) coupled to a motor. The lock wheel (13), which is in continuous motion (when the device is on), has a drive pin (23) located on the same shaft as said lock wheel (13) adapted to be engaged by a slot (24) of the geneva wheel (16) for driving the geneva wheel in an intermittent manner, alternating between a moving phase and a resting phase. It is appreciated by those skilled in the art that other configurations of geneva mechanisms could be employed for producing the same effect.

The device further comprises a cam wheel (45) having a radially-symmetric portion (14) that is adapted to contact a cam follower (10) located at one end of the sealing arm (12). The cam wheel (45) rotates in conjunction with the lock wheel (13). The cam wheel, however, is generally non-circular and it has different radii around its circumference. However, it has one radially-symmetric portion (14) that, when the cam wheel (45) rotates such that said radially-symmetric portion (14) increases the pressure on the cam follower (10), the sealing arm (12) is caused to move downward. This will be described further in Figure 4.

In Figure 3, the geneva wheel is in the moving phase. In Figure 4, the geneva wheel is in the resting phase. During the moving phase, the packaging material is advanced by a predetermined amount (said amount is determined by the size of the wheel (15) and the number of slots in the geneva wheel, according to the length of each row of packaging material). During the resting phase, sealing of the packaging material takes place via the sealing means.

Figure 2 shows the geneva mechanism just prior to the moving phase (at the end of a resting phase). The lock wheel (13) is continuously turning in the clockwise direction. The cam wheel (45) also rotates continuously with the lock wheel (13). For

every rotation of the lock wheel, the drive pin (23) becomes engaged by the geneva wheel a total of one time. As seen in Figure 3, when the drive pin (23) becomes engaged by a slot of the geneva wheel (16), the geneva wheel (16) is caused to turn in the counterclockwise direction until the lock wheel (13) rotates far enough so that the drive pin (23) becomes disengaged from the geneva wheel (16), thereby causing the geneva wheel to stop rotating. While the geneva wheel (16) is rotating, the upper and lower advance wheels (16) (18) rotate to cause the packaging material to be advanced through the device by a predetermined amount. Inflated packaging material sections (17) are thus advanced towards the exterior of the device while non-inflated packaging materials are advanced towards the inflating area of the device. After the drive pin (23) disengages from the geneva wheel (16), the lock wheel (13) and the cam wheel (45) continue to rotate such that the radially-symmetric portion (14) of the cam wheel (45) increases the pressure on the cam follower (10) at the end of the sealing arm (12) thereby causing said sealing arm (12) to push downward on the heat seal element (21). When it is pushed downward, the heat seal element (21) presses the packaging material against the seal pads so that sealing occurs. This can be seen in Figure 4. The lock wheel (13) and cam wheel (45) then continue to rotate, and the radially-symmetric portion (14) of the cam wheel (45) rotates passed the cam follower (10) such that the heating element (21) is raised to its original position, shown in Figure 2. Then the cycle repeats itself, with the drive pin (23) becoming engaged by the next slot of the geneva wheel (16). In this manner, the user can inflate the desired length of packaging material as it is needed.

It is appreciated that through the use of a geneva mechanism, the device of the present invention requires only one motor, and it can be made from relatively simple and few parts. The device is compact and also easy to use. The same device may be

adapted to accommodate different sizes or types of packaging material.

Claims

1. A device for producing inflated cellular packaging material from non-inflated packaging material on an as-needed basis, comprising advancing means for advancing non-inflated packaging material from a dispensing roll, inflating means for inflating sections of said non-inflated packaging material in a successive manner, sealing means for sealing said inflated sections of the packaging material as said sections are inflated, and a geneva mechanism comprising;

(a) a geneva wheel (16) having a plurality of slots (24);

(b) a lock wheel (13) coupled to a motor, said lock wheel having a drive pin

(23) engageable by said slots for driving the geneva wheel in an intermittent manner;

wherein the geneva mechanism is coupled to the advancing means and to sealing means such that said packaging material is advanced through the device in an intermittent manner, alternating between a resting phase and a moving phase, wherein during the resting phase, the sealing means operate to seal an inflated section of said packaging material, and during the moving phase, said sealed inflated section is conveyed towards the exterior of the device.

2. A device according to claim 1, wherein the advancing means comprises an upper advance wheel (15) and a lower advance wheel (18), said upper advance wheel being coupled to said geneva wheel such that when said drive pin is engaged a slot of the geneva wheel, the packaging material is advanced by a predetermined amount.

3. A device according to claim 1, wherein the inflating means comprises an air blower (11) and an inflating pipe (22).

4. A device according to claim 1, further comprising a cam wheel (45) and a cam follower (10), said cam wheel being coupled to said lock wheel, and said cam wheel

having a radially-symmetric portion (14) adapted to contact said cam follower.

5. A device according to claim 4, wherein the sealing means comprises a heat seal element (21), seal pads (20), and a sealing arm (12), wherein the cam follower is positioned at one end of the sealing arm such that when said radially-symmetric portion of the cam wheel contacts the cam follower, said sealing arm rotates downward, causing said heat seal element to move in a corresponding downward manner towards the seal pads so as to seal a section of inflated packaging material.

6. A device according to claim 5, wherein the radially-symmetric portion of the cam wheel increases the pressure on the cam follower when the geneva wheel is in a resting phase.

7. A device according to claim 1, adapted for packaging material that is pre-welded.

8. A device according to claim 1, adapted for packaging material that is not pre-welded.

9. A device for producing inflated cellular packaging material from non-inflated packaging material on an as-needed basis, comprising;

(a) a geneva mechanism containing a lock wheel (13) coupled to motor, and a geneva wheel (16), said lock wheel containing a drive pin (23) for driving movement of said geneva wheel (16) in an intermittent manner;

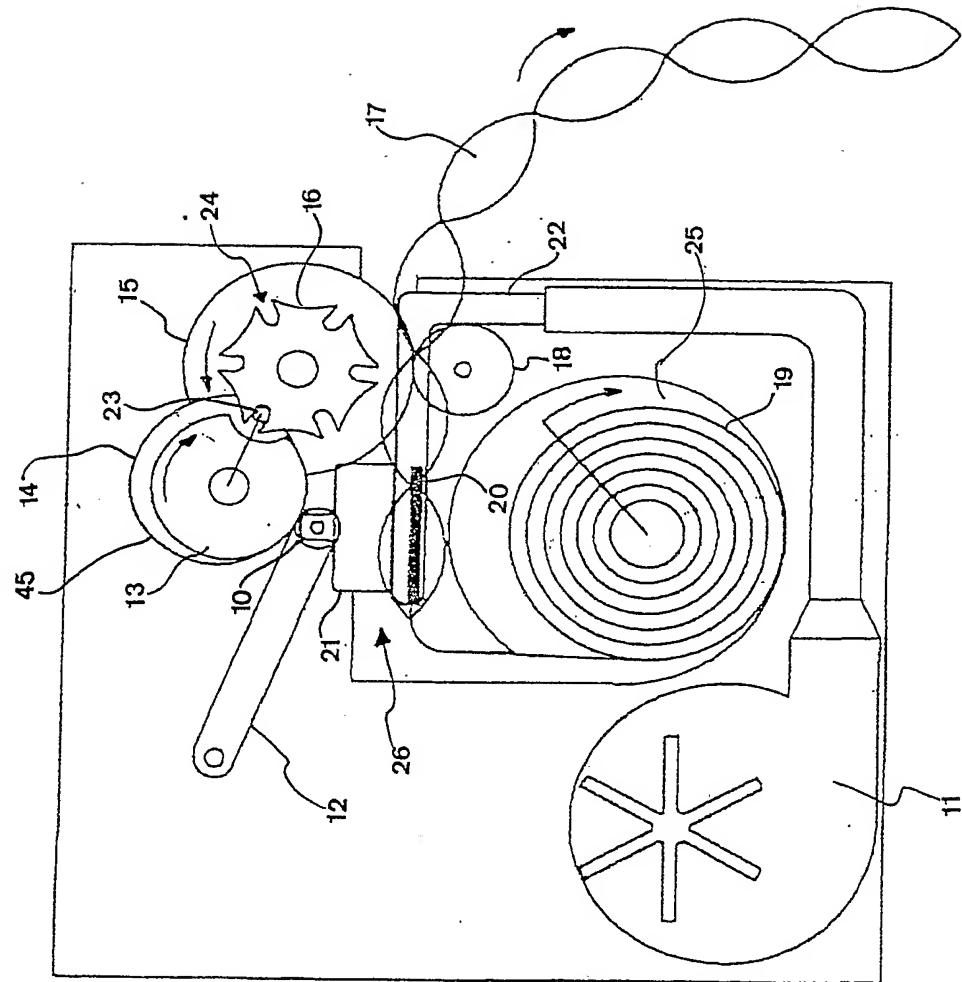
(b) a cam wheel (45) and a cam follower (10), said cam wheel being coupled to said lock wheel, and said cam wheel having a radially-symmetric portion (14);

(c) advancing means for advancing non-inflated packaging material from a dispensing roll, wherein said advancing means are coupled to said geneva wheel such that advancement of the packaging material occurs in an

- intermittent manner;
- (d) inflating means comprising an air blower (11) and an inflating pipe (22);
- (e) sealing means comprising a heat seal element (21), seal pads (20), and a sealing arm (12), wherein said cam follower is positioned at one end of said sealing arm such that when said radially-symmetric portion of the cam wheel contacts the cam follower, said sealing arm moves downward, causing said heat seal element to move in a corresponding downward manner towards said seal pads so as to seal a section of inflated packaging material.
10. A device according to claim 9, adapted for packaging material that is pre-welded.
11. A device according to claim 9, adapted for packaging material that is not pre-welded.

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FIGURE 1



2/2

FIGURE 2

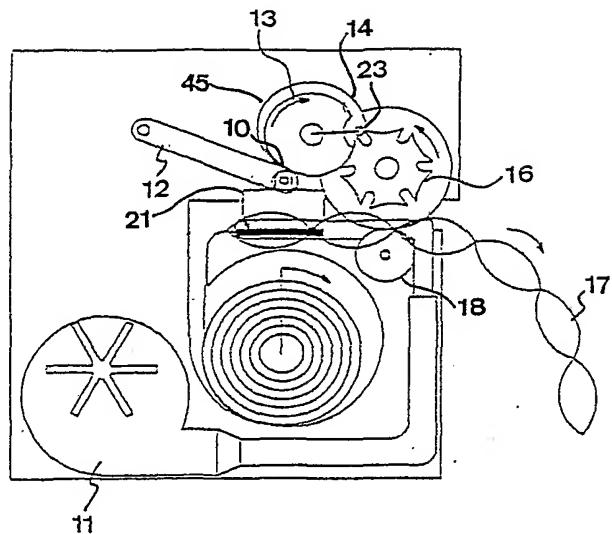


FIGURE 3

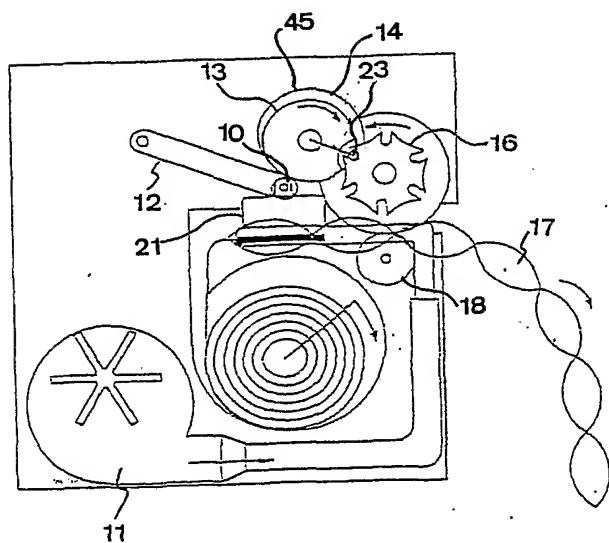
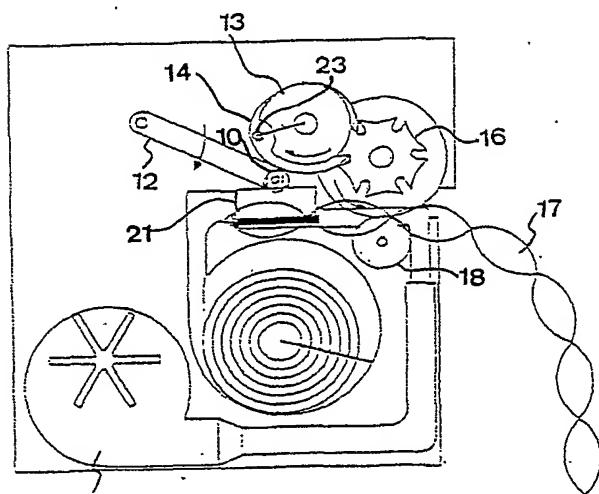


FIGURE 4



INTERNATIONAL SEARCH REPORT

Int	Application No
PCT/IL 02/00300	

A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7	B29C65/18	B65D81/03

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 004 399 A (BORRELLO DENIS) 25 January 1977 (1977-01-25) claim 1; figure 2 -----	1,2,7,8
A	DE 199 13 408 A (LOERSCH JOHANNES) 5 October 2000 (2000-10-05) claim 1; figures 6-8 -----	1-11
A	US 5 693 163 A (HOOVER ROGER A ET AL) 2 December 1997 (1997-12-02) column 4, line 59 -column 5, line 25; figure 4 -----	1-11

Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

° Special categories of cited documents :

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- "&" document member of the same patent family

Date of the actual completion of the international search

12 August 2002

Date of mailing of the international search report

30/08/2002

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Application No

PCT/IL 02/00300

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
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PUB-NO: WO002083399A1
DOCUMENT-IDENTIFIER: WO 2083399 A1
TITLE: DEVICE FOR INFLATING
PACKAGING MATERIAL
PUBN-DATE: October 24, 2002

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APPL-NO: IL00200300

APPL-DATE: April 13, 2002

PRIORITY-DATA: IL14265601A (April 17, 2001)

INT-CL (IPC): B29C065/18 , B65D081/03

EUR-CL (EPC): B29C065/00 , B29C067/00 ,
B31D005/00

ABSTRACT:

CHG DATE=20021203 STATUS=O>The invention discloses a device for producing inflated cellular

packaging material from non-inflated packaging material on an as-needed basis.